AP Stats Ch8 FRQ's
3HW Grades

FRQs will be graded based on the AP rubric and will earn a score of 0-4.

2000
Problem 6

Introduction to Q6's
- The 6th and final question is called the "**investigative task**."
- It is worth 25% of the free response section and usually takes 25-30 minutes to complete.
- The question usually has a "flow" (meaning the parts are connected) and almost always asks the students to do something new.
- Do not save this question until the end of the exam, as you will be too tired and rushed to think creatively. A good strategy is to complete question 1, then question 6, then the remaining 4 questions

2000 AP® STATISTICS FREE-RESPONSE QUESTIONS

STATISTICS

SECTION II

Part B

Question 6

Spend about 25 minutes on this part of the exam.

Percent of Section II grade—25

Show all your work. Indicate clearly the methods you use, because you will be graded on the correctness of your methods as well as on the accuracy of your results and explanation.

6. A random sample of 400 married couples was selected from a large population of married couples.

- Heights of married men are approximately normally distributed with mean 70 inches and standard deviation 3 inches.
- Heights of married women are approximately normally distributed with mean 65 inches and standard deviation 2.5 inches.
- There were 20 couples in which the wife was taller than her husband, and there were 380 couples in which the wife was shorter than her husband.

Scoring:

E P I

(a) Find a 95 percent confidence interval for the proportion of married couples in the population for which the wife is taller than her husband. Interpret your interval in the context of this question.

E P I (b) Suppose that a married man is selected at random and a married woman is selected at random. Find the approximate probability that the woman will be taller than the man.

E P I (c) Based on your answers to (a) and (b), are the heights of wives and their husbands independent? Explain your reasoning. TIPs: Independence is a probability concept. Think of couples versus individuals.

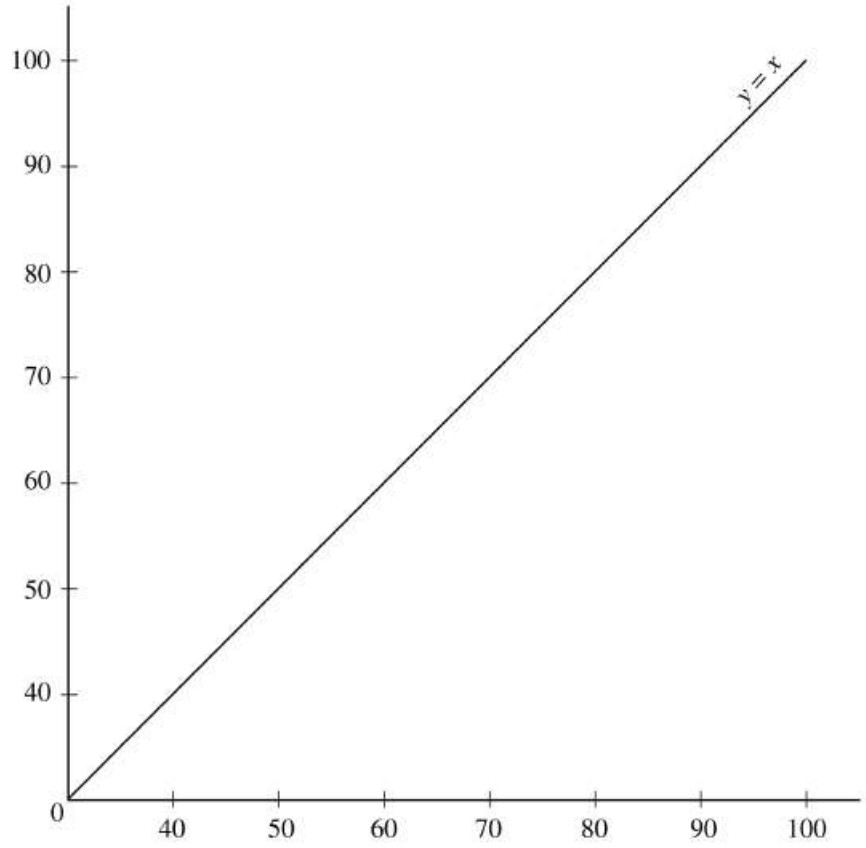
E P I

(d) A scatterplot (not shown) of husband's height versus wife's height for the 400 couples in the sample shows an approximately linear relationship with correlation 0.4. On the graph below, sketch an ellipse that could enclose the points on the scatterplot. Be sure to

- label your axes, and
- locate and orient your ellipse correctly with respect to the two axes and the line $y = x$.

Include any information that you think will be helpful in clarifying your sketch.

TIPs:
1) Think about the distribution of husbands and wives (μ,σ)
2) Look at green sheet for formulas for LSRL



Total:__/4

2003B Problem 6

FRQs will be graded based on the AP rubric and will earn a score of 0-4.

The following problem is taken from an actual Advanced Placement Statistics Examination.

- **Questions 1-5** (15% each): Your task is to generate a complete, concise statistical response in about 12 minutes.
- **Questions 6** (25%)**:** This is an investigative task using extended reasoning based on your statistical knowledge and applying it to a topic you were not specifically taught. Designed to be complete an in about 25 minutes;

INSTRUCTIONS: This is a question 6.
1) Complete IN PENCIL with only green sheet & calculator;
2) 25 minute time limit; feel free to go to other FRQ's and then return back to this Q6.
2) Go to College Board, USE PEN to score FRQ using their rubric;
3) Then, IN PEN, make the corrections necessary to receive a 4 on the FRQ.

2003 AP® STATISTICS FREE-RESPONSE QUESTIONS (Form B)

STATISTICS
SECTION II
Part B
Question 6
Spend about 25 minutes on this part of the exam.
Percent of Section II grade—25

Directions: Show all your work. Indicate clearly the methods you use, because you will be graded on the correctness of your methods as well as on the accuracy of your results and explanation.

6. Researchers at a large health maintenance organization (HMO) are planning a study of a certain mild illness. They will select a random sample of patients who are ages 35 to 54 and see if they contract the illness in the next year. The researchers are interested in estimating the proportions of men and of women who are likely to develop the illness in each of 4 age-groups: 35-39, 40-44, 45-49, and 50-54.

   The researchers plan to include 2,000 patients in the study. Suppose the researchers draw a random sample from all of the patients at this HMO who are ages 35 to 54 and find the following numbers within each gender and age-group.

	Age-Group			
	35-39	40-44	45-49	50-54
Male	350	230	150	60
Female	445	370	245	150

(a) Suppose that at the end of the study, 10 percent of the females in the 40-44 age-group contracted the illness. Calculate a 95 percent confidence interval to estimate the population proportion of females in this age-group that contracted the illness. TIPs: Focus on what the question is asking. You should be able to ace this part

Scoring:

E P I

Interpret this confidence interval in the context of this situation.

(a) continued on next page

Interpret the confidence level of 95 percent.

TIPs for Parts b and c:
1) Write the CI formula for a proportion and think about it;
2) Then think about how sample size is related to the CI;
3) Make sure to clearly show work and justify your answer

E P I

(b) Suppose that at the end of the study, 10 percent of the males in the 40-44 age-group contracted the illness. The corresponding 95 percent confidence interval to estimate the population proportion of males in this age-group that contracted the illness is (0.061, 0.139).

Note that this interval and the interval in part (a) are of different lengths even though the two sample proportions were identical. What would be an alternative way to allocate a sample of 2,000 subjects so that the 95 percent confidence interval widths for all male age-groups and for all female age-groups (i.e., for all 8 groups) would be the same when the sample proportions are the same? Justify your answer.

E P I

(c) Based on previous studies, researchers believe that the percentages of those who contract the illness will be similar for males and females, and therefore plan to ignore gender when selecting a sample for this study. Previous studies also indicate that the percentages of adults who will contract this illness in the 35-39, 40-44, 45-49, and 50-54 age-groups are anticipated to be 5%, 8%, 20%, and 35%, respectively. How should the sample of 2,000 subjects be allocated with respect to age-groups so that the widths of the 95 percent confidence intervals for the four groups will be approximately the same? Justify your answer.

Total:__/4

"FRAPPY"

{Free Response AP Problem...Yay!}

INSTRUCTIONS for FRQ's:

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YOU WILL BE GRADED ON COMPLETENESS OF YOUR FINAL PRODUCT (NOTACTUAL SCORE).

A car manufacturer is interested in conducting a study to estimate the mean stopping distance for a new type of brakes when used in a car that is traveling at 60 miles per hour. These new brakes will be installed on cars of the same model and the stopping distance will be observed. The cost of each observation is $100. A budget of $12,000 is available to conduct the study and the goal is to cary it out in the most economical way possible. Preliminary studies indicate that σ = 12 feet for stopping distances.

Scoring:

(a) Are sufficient funds available to estimate the mean stopping distance to within 2 feet of the true mean stopping distance with 95% confidence?

Explain your answer.

E P I

"FRAPPY"

{Free Response AP Problem...Yay!}

Scoring:

(b) A regulatory agency requires a 95% level of confidence for an estimate of mean stopping distance that is within 2 feet of the true mean stopping distance. The car manufacturer cannot exceed the budget of $12,000 for the study. Discuss the consequences of these constraints.

E P I

Total:__/4

"FRAPPY"

{Free Response AP Problem...Yay!}

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Anthropologists have discovered a prehistoric cave dwelling that contains a large number of adult human footprints. To study the size of the adults who used the cave dwelling, they randomly selected 20 of the footprints from the population of all footprints in the cave and measured the length of those footprints. Some statistics resulting from this random sample are as follows.

Sample size	20	Minimum	15.2 cm
Mean	24.8 cm	First quartile	18.7 cm
Standard deviation	7.5 cm	Median	21.5 cm
		Third quartile	30.0 cm
		Maximum	37.0 cm

The anthropologists would like to construct a 95 percent confidence interval for the mean foot length of the adults who used the cave dwelling.

(a) What assumptions are necessary in order for this confidence interval to be appropriate?

(b) Discuss whether each of the assumptions listed in your response to (a) appears to be satisfied in this situation.

Total:__/4

"FRAPPY"
{Free Response AP Problem...Yay!}

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YOU WILL BE GRADED ON COMPLETENESS OF YOUR FINAL PRODUCT (NOTACTUAL SCORE).

A humane society wanted to estimate with 95 percent confidence the proportion of households in its county that own at least one dog.

Scoring:

(a) Interpret the 95 confidence level in this context.

E P I

The humane society selected a random sample of households in its county and used the sample to estimate the proportion of all households that own at least one dog. The conditions for calculating a 95 percent confidence interval for the proportion of households in this county that own at least one dog were checked and verified, and the resulting confidence interval was 0.417 ± 0.119.

(b) A national pet products association claimed that 39 percent of all American households owned at least one dog. Does the humane society's interval estimate provide evidence that the proportion of dog owners in its county is different from the claimed national proportion? Explain.

E P I

"FRAPPY"

{Free Response AP Problem...Yay!}

Scoring:

(c) How many households were selected in the humane society's sample?
Show how you obtained your answer.

E P I

Total:__/4